Clinicians' and Patients' Experiences and Satisfaction with Unscheduled, Nighttime, Internet-based Video Conferencing for Assessing Acute Medical Problems in a Nursing Facility

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ABSTRACT

Videoconferencing between patients and their physicians can increase patients' access to healthcare. Unscheduled videoconferencing can benefit patients with acute medical problems but has not been studied extensively. We conducted a clinical trial of unscheduled, nighttime videoconferencing in a nursing home, where on-call physicians usually provide care by telephone from remote locations. Although most calls for medical problems did not lead to videoconferencing, physicians and nursing-home residents were satisfied with videoconferencing when it did occur, and physicians reported that making medical decisions was easier with videoconferencing. Videoconferencing was most often conducted to assess residents with changes in mental status, abnormal laboratory values, or falls. Physicians often lacked immediate access to videoconferencing equipment when medical problems with residents occurred. This application could benefit from improved access and portability of equipment.

INTRODUCTION

Benefits of telemedicine include improved access to healthcare, improved resource utilization,[1] and decreased time to make diagnoses and medical decisions.[2] The Internet has been used successfully to provide telehealth-based care for patients at home,[3] and some predict that Web-based programs will "become the primary venue for remote patient management".[4] The U.S. Medicare and Medicaid programs reimburse interactive videoconferencing in some regions.[2, 5-7] As of October 2001, Medicare coverage for telemedicine included interactive office visits and consultations, with reimbursement for remote services equal to what would have been paid without telemedicine technology.[8]

Reports of telemedicine studies of geriatrics populations are increasing. Low-bandwidth videoconferencing has been used successfully for physical rehabilitation consultations.[9] In Hong Kong, government-run Community Geriatric Assessment Teams have used videoconferencing in residential care homes: in a one-year pilot study in 1998, routine or semi-urgent services were provided by a multidisciplinary team, mostly to educate patients, manage wounds, assess indications for hospitalization, assess swallowing, and prevent falls. Due to a 9% reduction in visits to the emergency department, the intervention resulted in significant cost savings, and most patients were comfortable with the consultations.[10, 11] In studies of seniors in a Florida retirement community, patients' opinions about an 8-week telemedicine program were positive.[12] Satisfaction there has increased in the past few years, probably due to familiarity with and improvements in technology. Telemedicine has also been used to detect changes in cognitive status,[13], mood, and behavior in older patients hospitalized[14] or living alone in community settings.[15]

In emergency settings, telemedicine has been used to provide radiographic interpretation, provide supervision of healthcare providers, and transmit electrocardiograms prior to a patient's arrival to an emergency room.[16] Despite this, few studies have focused on unscheduled conferencing.[2, 17-23] In this report, we describe early results of a clinical trial of unscheduled, nighttime videoconferencing between residents of a nursing facility and their off-site, on-call physicians. Our goal was to determine how often videoconferencing was useful and which medical conditions in the nursing home were most likely to lead to videoconferencing.

METHODS

Videoconferencing Equipment

We constructed a portable, wireless[24] videoconferencing workstation for use in the nursing home.[25] The workstation facilitated inspection of the resident and interpersonal interactions but not features such as remote auscultation or electrocardiography. For videoconferencing, the $6,085 cart is brought to a patient's bedside, and encrypted, interactive videoconferencing occurs via Internet to the on-call physician's home, using a bedside speakerphone, remotely controllable camera, the H.323 data-transport standard,[26] and a cable modem, PC, and "web cam" at the physician's end. For documentation and archiving, recording of all videos was attempted. To secure the Internet channel, we developed a $250 IPsec-based router with a virtual private network that could also handle the requirements for throughput.[25, 27]

Participation of Nursing-Home Residents

We included residents of any age, admitted to a 240-bed, state-managed, urban nursing home during the 12-month period from 01 July 2001 to 21 July 2002. The nursing home is located on the medical campus of Indiana University-Purdue University Indianapolis, and all physicians who provide care for the residents are university faculty. We excluded residents with end-stage renal disease, expected stays of 72 hours or less, or inability to speak intelligible English. After administration of the Short Portable Mental Status Questionnaire,[28] we also excluded residents without English-speaking proxies if the screening suggested dementia. Using computer-generated random numbers, consenting participants were then randomized to control or intervention groups, for separate analyses comparing resource utilization between groups. Here we report only the early findings from studying the intervention group.

Unscheduled, Nighttime Videoconferencing

During nighttime study hours, an in-house research assistant processed all calls for acute medical problems, by logging the calls using the institution's computer-based provider order-entry system.[29, 30] The system retrieved the study status of the patient and forwarded a message about the problem to the physician's pager, including whether a video was authorized ("Yes" for conditions likely amenable to videoconferencing *a priori*; "Discretionary" when usefulness of videoconferencing was more questionable; and "No" for non-participating residents). Interactive videoconferencing could be conducted if the physician were available at the home workstation. Through the workstations, physicians also had access to elements of the electronic medical record, such as laboratory values (for participants in control and intervention groups) and previously recorded videos (only for participants in the intervention group). When physicians were not available for videoconferencing, a non-interactive, scripted batch video could be recorded for later review. Physicians were asked to rate on log paper the usefulness of each episode of videoconferencing. Participating residents were also asked their opinions about videoconferencing. Physicians were also asked later about the impact of videoconferencing on medical decision-making and residents' healthcare. Approximately 28-35 study hours occurred each week on weeknights, plus 0-14 hours per week on weekends. A group of 6 study physicians sharing a nighttime and weekend call schedule participated.

RESULTS

The six study physicians ranged in age from 37 to 61 years (mean: 45). Five were men, and one was African-American. A total of 548 nursing-home residents were identified, and 536 were screened for eligibility. Of these, we excluded 2 due to short expected stays, 10 due to end-stage renal disease, 16 due to language barriers, 4 due to cognitive impairment plus an unreachable or unintelligible proxy, and 8 due to established but unreachable proxies. Of the remaining 496 eligible residents, 369 (74%) agreed to participate. Of these, 187 (51%) were randomized to the video group and were eligible to undergo videoconferencing. One participant subsequently withdrew, stating that she was having increasing difficulty understanding her environment. Another withdrew due to impatience following a technical difficulty during videoconferencing.

Characteristics of participating residents are shown in Table 1. There were 394 calls about medical problems. Videoconferencing was authorized ("Discretionary", "Yes", or unknown) for 320 (81%) of the calls about residents in the intervention group and was completed for 47 (15%) of these (Table 2). Videoconferencing was most often conducted to assess participants with changes in mental status, abnormal laboratory values, or falls (Table 3). Conditions for which physicians did not request videoconferencing included admission to the facility, constipation, questions about drugs, new laboratory results, and most cases of abnormal bedside glucose.

Table 1. Characteristics of, calls about, and videos of participants (N = 187)

Characteristic	Value
Age, years (mean)	64
Race, African-American (%)	53
Gender, female (%)	63
Number of calls per resident	
0 calls	68
1-10 calls	112
>10 calls	7
Number of videos per resident	
0 videos	151
1-2 videos	34
>2 videos	2

Table 2. Calls and interactive or batch videos about acute medical problems for intervention participants (N = 187)

Authorization for video	Calls	Videos	Videos/ Calls (%)
"No"	74	0	0
"Discretionary"	165	9	5
"Yes"	150	33	22
Unknown (technical problem)	5	5	100
TOTAL	394	47	12

Physicians rated 27 of the videoconferencing sessions (Table 4), according to whether the recording (i.e., archiving) of the video was completed successfully. Several videos were completed without any difficulties except for a failed recording. Other common technical problems included absence or dropout of audio, degradation of image quality, hanging or "freezing" during conferencing, and failure to connect. Physicians were quite satisfied with the videos overall. When asked, "To what extent has our new telemedicine program changed your workload (1 = workload is greater, 7 = workload is lighter)?", the mean rating was 4, indicating no change. When asked, "To what extent has the telemedicine program changed patient care (1 = care is worse, 7 = care is better)?", the mean rating was 5.5, indicating better care (data not shown).

Table 3. Reasons physicians conducted live videoconferencing (N = 23 live videos assessed)

Reason	Percentage
Mental status	26
Abnormal laboratory value or bedside glucose	22
Fall	13
Pain	8.7
Rash, ulcer, or other skin problem	8.7
Gastrointestinal discomfort	8.7
Dyspnea	4.3
Injury	4.3
Hemorrhage	4.3

Table 4. Physicians' ratings of 27 videos*

	Video recording was successful	
Characteristic	No (12 videos	Yes (15 videos)
Type of video		
Batch	17	13
Interactive	83	87
Technical problem was noted	83	14
Location at time of video		
Home	67	87
Work	17	6.7
Car	17	6.7
Satisfaction with video		
1 = very dissatisfied	0	0
2	0	7.7
3 = neutral	50	15
4	25	54
5 = very satisfied	0	0
Missing	25	23
Medical decision was easier with video		
No	0	17
Yes	50	83
"N/A"	50	0

*Cells contain percentages

In about half of the videoconferencing episodes, participating residents could not comment on the sessions (e.g., due to dementia or sensory

impairment), but when asked to rate communication with the doctor, no residents reported that communication was poor or that the communications made healthcare worse than usual (data not shown). No adverse events were reported.

DISCUSSION

Physicians indicated that unscheduled, nighttime videoconferencing in a nursing facility eases medical decision-making, improves healthcare, and can be performed safely and inexpensively, using wireless and other portable components to bring to the bedsides of disabled individuals.

Failure to perform authorized videoconferencing had multiple causes. First, teleconsultation does require more preparation than in-person rounds,[31] and many calls from nurses to physicians in our study occurred when physicians were unable to access their video stations.[32] Greater accessibility[33] and portability[32] of equipment at the remote end are needed to increase physicians' access to videoconferencing during on-call nighttime hours.

Second, many or most calls from nurses to physicians in this setting do not prompt the need for videoconferencing. Reports by others corroborate this notion: Sävenstedt *et al.* reported that of 118 problems generated in a nursing facility in 9 weeks, only 70 were addressed through teleconsultation.[31] Nevertheless, videoconferencing in our study was found to be useful for several acute medical conditions in the nursing home, especially changes in mental status, abnormal laboratory values, and falls. Even with limited videoconferencing, this technology could provide substantial cost savings if only a few visits to an emergency department or hospital could be avoided. More detailed clinical information was limited at the time of this report, but we are now in the process of analyzing health resource utilization of residents who participated in the study.

Technical problems were common and were difficult to solve immediately, since videoconferencing occurred at night, when technical staff were not available. The problems with voice over IP have been discussed by us[32] and others.[34] As a backup to voice over IP, simple and more reliable audio systems, such as conventional telephones, can be used simultaneously with picture-only video communications when necessary.

In conclusion, both physicians and residents of a nursing home accept unscheduled videoconferencing, though it may be most useful in addressing less common but more worrisome reasons for after-hours calls from the nursing home. This application may be even more beneficial in regions with fewer geriatrics physicians and those in which one physician provides care to patients in multiple, geographically separated institutions.

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